INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Memorandum

December 17, 2007

CONSTRUCTION MEMORANDUM
07-27

TO: District Deputy Commissioners
District Highway Operation Directors
District Construction Engineers
District Testing Engineers
District Area Engineers
Project Engineers/Supervisors

FROM: for Mark A. Miller, Director RLH
Division of Construction Management

SUBJECT: HMA Revisions for 2008

Attached is a Special Provision that should be incorporated by means of a no cost change order into all existing contracts that have QC/QA HMA or HMA pay items as designated in Sections 401.22, 402 .20, and 410.22. Contracts let beginning in January 2008 should include these revisions in the contract documents. Please check all contracts and add this special provision if necessary. These revisions are being made to provide for uniformity for all contract work related to HMA items in 2008.

The reasons for the revisions to the Specifications include the following:

AASHTO T 331 (Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing) -- This test procedure replaces the current test method (ASTM D 6752) for the bulk specific gravity of OG 19.0 and OG 25.0 mixtures. The AASHTO procedure has a check on a possible leak in the bag by requiring the weight of the specimen after weighing-in-water to be within -0.08% and +0.04% of the weight of the initial mass of specimen. This is a more accurate procedure than the current specification requirement of a 5 minute time period for duration of test and requirement that the test is considered invalid if the specimen exceeds 5 g from the initial mass of the specimen.

AASHTO T 209 (Theoretical Maximum Specific Gravity and Density of Hot-Mix Asphalt Paving Mixtures) -- The reference to Section 9.5.1 was added to be consistent with the current specification for the appeal maximum specific gravity requirement of 401.20(a) and to emphasize that the maximum specific gravity test is required to be conducted by the weighing-in-water method.

AASHTO T 166 (Bulk Specific Gravity of Compacted Hot-Mix Asphalt Using Saturated Surface-Dry Specimens) -- Method A was added to AASHTO T 166 to require the bulk specific gravity to be conducted by weighing the sample in a water bath rather than in a volumeter as required by Method B.

Binder Grade Change -- The INDOT laboratory binder study indicated that there is an insignificant change in the volumetric properties when there is a change in the grade of asphalt for the same aggregate structure. Requiring a new mix design for a binder grade change is not needed. Since the volumetric properties are verified from samples taken from the pavement, there is a final check on the HMA.

Since a higher upper temperature classification of the PG grade will normally result in higher Tensile Strength Ratio (TSR) values, AASHTO T 283 for moisture susceptibility will be required if the original mix design upper temperature classification of the PG grade is higher than the requested PG grade (i.e., original PG 70 mix design and requesting a mix design with PG 64 will require a TSR value to be determined for the PG 64 grade mixture).

A new DMF is required to be submitted and reference the original mix design for a binder grade change with the same aggregate structure.

Binder Source Change -- The INDOT laboratory binder study also indicated that there is an insignificant change in volumetric properties when the asphalt grade source is changed. Currently a new mixture design is not required for a change in the source for PG 58-28 or PG 64-22 binders. This revision will not require a new mix design for a change in any grade of binder.

A copy of the load ticket identifying the binder source is required to be submitted with the sublot binder samples to allow improved tracking of the source of the binders

Mixture Adjustment Factor (MAF) -- The procedure for determining MAF values was revised to make the change in values more gradual if the calculated values for the MAF are less than 0.980 or greater than 1.020. This procedure will better define the planned quantity, lay rate, and pay quantity that require adjustment.

Moisture Content -- We have not required moisture tests for HMA and SMA mixtures in 2006 or 2007 through a Special Provision because our experience with moisture tests is that they rarely fail, and when failures do occur no detrimental effects to the pavement have been observed. The Certified HMA Program requires that moisture tests be monitored as part of the plant QCP. Also, Sections 401.10 and 410.10 require removal of HMA or SMA when flushing or bleeding occurs. This addition to the Special Provision is to reemphasize that no moisture test is required.

Certificate of Compliance -- The requirement for a Certificate of Compliance for paving equipment implies that there is a form or format for this document and there is none. The revision to just "written documentation" will require that the Contractor submit any document as long as the document includes the manufacturer's make, model, serial number, manufactured year, and the manufacturer's literature with pictures of the paving equipment.

Fine Aggregate Angularity (FAA) -- A statement was added to not require the FAA test for open graded mixtures. A small amount of fine aggregate is normally added to open graded mixtures to have enough aggregate to absorb the heat in the plant dryer to prevent the dryer flame from possibly causing a fire in the plant baghouse. The intent of open graded mixtures is not compromised by adding a small amount of fine aggregate; however, the FAA test is not appropriate for the fine aggregate. The purpose of the open graded mixture is to provide a layer that will drain moisture and the air voids required to provide the drainage are measured during production of the mixture. The fine aggregate would not affect the air voids significantly.

MAM:rpw

attachment

400-R-547 HMA REVISIONS FOR 2008

(Adopted 12-13-07)

The Standard Specifications are revised as follows:

SECTION 401, LINE 77, DELETE AND INSERT AS FOLLOWS:

~~Bulk Specific Gravity of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing ..... ASTM D 6752~~

Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing ..... AASHTO T 331

SECTION 401, LINE 90, INSERT AS FOLLOWS:

The optimum binder content for dense graded mixtures shall produce 4.0% air voids at N_{des} and for open graded mixtures shall produce 15.0% – 20.0% air voids at N_{des}. The design for dense graded mixtures shall have at least four points, including a minimum of two points above and one point below the optimum. A one point design may be used for open graded mixtures. The maximum specific gravity of the uncompressed mixture shall be determined in accordance with AASHTO T 209, *Section 9.5.1.*

SECTION 401, LINE 108, DELETE AND INSERT AS FOLLOWS:

A PG binder grade or source change will not require a new mix design. If the upper temperature classification of the PG binder is lower than the original PG grade, a new TSR value is required. A new DMF shall be submitted for a binder grade change and shall reference the originating DMF/JMF number.

The MAF equals the Gmm from the mixture design divided by the following: 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures. If the MAF calculation results in a value where $0.980 \leq MAF \leq 1.020$, then the MAF shall be considered to be 1.000. ~~If the calculated MAF is outside of the above range, then the actual calculated value shall be used.~~ *If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value.* The MAF does not apply to OG mixtures.

SECTION 401, LINE 119, DELETE AS FOLLOWS:

~~Changes in the source of specified binders, except for PG 58-28 or PG 64-22, shall require a new DMF. Changes in the grade of a specified binder shall require a new DMF.~~

SECTION 401, LINE 178, DELETE AS FOLLOWS:

Acceptance of mixtures for binder content, VMA at N_{des}, and air voids at N_{des} for each lot will be based on tests performed by the Engineer. ~~Acceptance testing for surface mixtures will include tests for moisture content.~~ The Engineer will randomly select the location(s) within each sublot for sampling in accordance with ITM 802. An acceptance sample will consist of two plate samples with the first being at the random location and the second 2 ft (0.6 m) ahead station. A backup sample consisting of two plate samples shall be located 2 ft (0.6 m) towards the center of the mat from the acceptance sample.

~~For surface mixtures, an additional sample shall be located 2 ft (0.6 m) back station from the random sample location.~~

SECTION 401, LINE 201, DELETE AND INSERT AS FOLLOWS:

The bulk specific gravity of gyratory specimens for dense graded mixtures will be determined in accordance with AASHTO T 166, *Method A* except samples are not required to be dried overnight. The bulk specific gravity of gyratory specimens for open graded mixtures, OG19.0, OG25.0, will be determined in accordance with ~~ASTM D 6752, except as follows. The duration of the test from initiating the vacuum extraction to weighing the specimen after the water bath will not exceed five minutes. The mass of water absorbed by the specimen while in the water bath will be subtracted from the mass of the specimen obtained in the water bath. Any test in which the mass of water absorbed by the specimen exceeds 5 g is invalid~~ *AASHTO T 331*.

SECTION 401, LINE 211, DELETE AND INSERT AS FOLLOWS:

The mixture properties for each sublot shall meet the requirements for the tolerances from the JMF as shown in the table as follows:

ACCEPTANCE TOLERANCES	
MIXTURE PROPERTIES	TOLERANCES FROM THE JMF
DENSE GRADED	
Air Voids	JMF ± 1.0%
Binder Content	JMF ± 0.5%
VMA	JMF ±1.0%
OPEN GRADED	
Air Voids*	JMF ± 3.0%
Binder Content	JMF ± 0.5%
* Gmb will be determined in accordance with ~~ASTM D 6752~~ *AASHTO T 331*	

SECTION 401, LINE 215, DELETE AS FOLLOWS:

~~The maximum percent of moisture in the mixture shall not exceed 0.10 from plate samples.~~

SECTION 401, LINE 225, DELETE AND ADD AS FOLLOWS:

Air voids, binder content and VMA values will be reported to the nearest 0.1%. ~~Moisture and d~~*D*raindown test results will be rounded to the nearest 0.01%. Rounding will be in accordance with 109.01(a).

SECTION 401, LINE 245, DELETE AND INSERT AS FOLLOWS:

Equipment for HMA operations shall be in accordance with 409. The Contractor shall submit to the Engineer a written ~~Certificate of Compliance~~ *documentation* that includes the manufacturer's make, model, serial number, manufactured year, and the manufacturer's literature with pictures. The ~~Certificate of Compliance~~ *documentation* shall be submitted prior to use and shall certify that the paving equipment proposed for the project is new and includes the modifications or have been modified in accordance with the following.

SECTION 401, LINE 403, DELETE AND INSERT AS FOLLOWS:

The density for the mixture will be expressed as the percentage of maximum specific gravity (%MSG) obtained by dividing the average bulk specific gravity by the maximum specific gravity for the sublot, times 100. *Samples for the bulk specific gravity and maximum specific gravity will be dried in accordance with ITM 572.* The Engineer will determine the ~~BSG~~ *bulk specific gravity* of the cores in accordance with AASHTO T 166, *Method A.* The maximum specific gravity will be determined in accordance with AASHTO T 209, *Section 9.5.1* ~~from samples prepared in accordance with ITM 572~~. The target value for density of dense graded mixtures of each sublot shall be 92.0%.

SECTION 401, LINE 614, INSERT AS FOLLOWS:

Additional cores shall be taken within seven calendar days unless otherwise directed. Additional core locations will be determined by adding 1.0 ft (0.3 m) longitudinally of the cores tested using the same transverse offset. The appeal density cores will be tested in accordance with AASHTO T 166, *Method A.*

SECTION 402, LINE 52, DELETE AND INSERT AS FOLLOWS:

The MAF equals the Gmm from the mixture design divided by the following: 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures. If the MAF calculation results in a value where $0.980 \leq MAF \leq 1.020$, then the MAF shall be considered to be 1.000. ~~If the calculated MAF is outside of the above range, then the actual calculated value shall be used.~~ *If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value.* The MAF does not apply to OG mixtures.

SECTION 402, LINE 346, INSERT AS FOLLOWS:

The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166, *Method A.*. The maximum specific gravity will be determined in accordance with AASHTO T 209, *Section 9.5.1.* Density shall not be less than 92.0%.

SECTION 410, LINE 84, INSERT AS FOLLOWS:

The optimum binder and aggregate gradation content shall produce 4.0% air voids. The maximum specific gravity of the uncompacted mixture shall be determined in accordance with AASHTO T 209, *Section 9.5.1.*. The percent draindown for SMA surface mixture shall not exceed 0.30% in accordance with AASHTO T 305.

SECTION 410, LINE 89, DELETE AND INSERT AS FOLLOWS

The MAF equals the Gmm from the mixture design divided by the following: 2.465 for 9.5 mm mixtures and 2.500 for 12.5 mm, 19.0 mm, and 25.0 mm mixtures. If the MAF calculation results in a value where $0.980 \leq MAF \leq 1.020$, then the MAF shall be considered to be 1.000. ~~If the calculated MAF is outside of the above range, then the actual calculated value shall be used.~~ *If the MAF is greater than 1.020, the calculated MAF value shall have 0.020 subtracted from the value. If the MAF is less than 0.980, the calculated MAF value shall have 0.020 added to the value.* The MAF does not apply to OG mixtures.

SECTION 410, LINE 137, DELETE AS FOLLOWS:

Acceptance of mixtures for binder content, ~~moisture,~~ and gradation for each lot will be based on tests performed by the Engineer. The Engineer will randomly select the location(s) within each sublot for sampling in accordance with ITM 802.

Samples from each location shall be obtained from each sublot from the pavement in accordance with ITM 580. ~~The second sample shall be located from the random sample by offsetting 1 ft (0.3 m) transversely towards the center of the mat and will be used for the moisture sample.~~ The test results of the sublots will be averaged and shall meet the requirements for tolerances from the JMF for each sieve and binder content.

~~The maximum percent of moisture in the mixture shall not exceed 0.10 from plate samples.~~

SECTION 410, LINE 170, DELETE AS FOLLOWS:

Single test values and averages will be reported to the nearest 0.1% ~~except moisture will be reported to the nearest 0.01%~~. Rounding will be in accordance with 109.01(a).

SECTION 410, LINE 313, INSERT AS FOLLOWS:

The density of the mixture will be expressed as the percentage of maximum specific gravity (%MSG) obtained by dividing the average bulk specific gravity by the maximum specific gravity for the sublot, times 100. *Samples for the bulk specific gravity and maximum specific gravity will be dried in accordance with ITM 572.* The Engineer will determine the BSG of the cores in accordance with AASHTO T 166, *Method A*. The maximum specific gravity will be determined in accordance with AASHTO T 209, *Section 9.5.1.* ~~from plant produced materials prepared in accordance with ITM 572.~~ The target value for density of SMA mixtures of each sublot shall be 93.0%.

The Engineer will determine the bulk specific gravity of the cores in accordance with AASHTO T 166 The maximum specific gravity will be determined in accordance with AASHTO T 209 Density shall not be less than 92.0%.

SECTION 902, LINE 22, DELETE AND INSERT AS FOLLOWS:

~~Each Sample~~ *An acceptance sample and backup sample* shall be taken from the asphalt delivery system at the HMA plant. ~~Each sample~~ *The two samples* will represent a sublot. *A copy of a load ticket identifying the binder source shall be submitted with the sublot samples.* The Department will randomly select one sublot from each lot in accordance with ITM 802 for either complete or partial testing. If the sublot selected is in compliance, the lot will be accepted. If the sublot is not in compliance, the material will be adjudicated as a failed material in accordance with 105.03.

SECTION 904, LINE 127, INSERT AS FOLLOWS:

The fine aggregate angularity value shall not apply to OG mixtures.